ABSTRACT

PEO/CLAY BASED NANOCOMPOSITES FOR LITHIUM BATTERIES <u>April Buckley</u> 10001 South Woodlawn Ave. Chicago, IL 60620, Poopie718@AOL.com, Dr. Giselle Sandi*

The development of a lithium polymer battery would alleviate many limitations that are currently inhibiting a suitable cycle life for electronics of higher energy applications. The goal of our research is to develop a solid membrane that would replace the liquid electrolyte and be able to efficiently transfer lithium ions between the anode and cathode. This would improve the batteries' cycle life and its' overall performance. When the batteries are used under proper conditions, a solid membrane would decrease the chances of leakage and exposure to hazardous chemicals. The two synthetic clays that were used to make our membranes are Synthetic Lithium Hectorite clay (SLH) and Tetraethylorthosilicate clay (TEOS). Once these clays were produced in a powdered form they were mixed with different ratios of Poly (ethylene oxide) (PEO) which is a polymer, to enhance the transfer of lithium ions: therefore, enhancing conductivity. There were five different membranes made. Two types of catalytic membranes were made with platinum and palladium. One membrane was made with zirconia and the other types were made with PEO / SLH or PEO / TEOS ratios. When a viable membrane was produced it was ran through a series of characterization analysis including thermogravemetric analysis to measure the weight, x-ray diffraction analysis to analyze the structure and electrochemical impedance spectroscopy to measure the conductivity. Of all the membranes that were made, the one that had the best characteristics was a 1.2 PEO / TEOS membrane. X-ray diffraction analysis shows that the polymer (PEO) was successfully intercalated within the layers of the clay but there was also excess polymer around the layers. Electrochemical impedance spectroscopy confirms that our membrane has a conductivity of 10^{-5} but the conductivity that is feasible for a lithium battery is 10^{-3}.